

Trends in breast cancer mortality rates by region of the United States, 1950–1999

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Received 9 September 2003; accepted in revised form 1 July 2004

Key words: breast cancer, mortality, trends.

Abstract

Introduction: Limited information is available on trends in breast cancer mortality by region of the country.

Methods: Rates for broad age groups were calculated from 1950 to 1999 for whites and 1970–1999 for blacks for four census regions and 508 state economic areas of the United States.

Results: For white women ages 50–64 years, the mortality relative risk [RR] for the Northeast compared to the South was 1.48 in 1950–1959 and 1.15 in 1990–1999. Rates increased in all regions from the 1950s to 1960s but more substantially in the South, increased slightly in the 1970s in all regions, declined slightly in the Northeast, Midwest and West but not in the South in the 1980s, and declined more in the Northeast, Midwest and West than in the South in the 1990s. Among similarly aged black women, the RRs for the Northeast compared to the South were 1.13 and 1.0 in 1970–1979 and 1990–1999, respectively. Among these women, rates increased in all regions in the 1980s; in the 1990s rates declined in the Northeast, Midwest and West but continued to increase in the South.

Conclusion: The historically lower breast cancer mortality rates in the South have been eroded because of relatively less favorable trends in the South.

Introduction

Breast cancer is the second leading cause of cancer death among American women [1]. For at least several decades, breast cancer mortality rates have been highest in the Northeastern part of the US, intermediate in the Midwest and West, and lowest in the South [2]. There has been attenuation in the geographic variation in breast cancer mortality rates over time [3]. Although many studies have investigated temporal trends in breast cancer mortality rates for the nation as a whole [4–8], few have provided information on time trends separately by region of the country (*i.e.*, Northeast, Midwest, West and South) [3, 7]. The present study addresses an important gap in the existing literature by presenting mortality rates over a broad and updated calendar

period (1950–1999), with detailed information on patterns by region, age and race. Monitoring time trends in breast cancer mortality rates by region is important to evaluate progress against breast cancer by geographic area [5].

Material and methods

Information on deaths during 1950–1999 due to breast cancer was provided by the National Center for Health Statistics (Hyattsville, MD), and population estimates were based on data provided by the Census Bureau (Suitland, MD). The data used were based on the underlying cause of death as recorded on the death certificate and coded by the National Center for Health Statistics. County-level data were aggregated for each of 508 state economic areas (SEAs), which are individual counties or groups of counties defined by the Census Bureau to be relatively homogenous with respect to various demographic and cultural factors [9]. The SEAs were defined by the Census Bureau using data from the

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1960 census; we used the same definition over the entire time period. We chose to present data by SEAs because states include heterogeneous populations and are less useful in identifying areas where future analytic studies might be fruitful and where cancer prevention and control activities might be targeted. For white and black women in two age groups (20–49 years, 50 years and older), SEA-specific rates per 100,000 woman-years for three calendar periods for white women (1950–1969, 1970–1989, 1990–1999) and two calendar periods for black women (1970–1989, 1990–1999) were directly age-adjusted using the 2000 US population distribution as the standard. Prior to 1970, computerized death records contain racial information only in broad categories (*i.e.*, white/non-white).

We deemed rates for an SEA to be unstable on the basis of sparse data if the observed number of deaths was fewer than 12. To facilitate a comparison of rates over time and by race, SEA-level rates for the total of five categories of time periods (three time periods for whites and two for blacks) were ranked and partitioned into deciles separately for two age groups (20–49, and 50 years and older). Thus, the same decile cutpoints are used for each map pertaining to older women regardless of race or time period; similarly, the same decile cutpoints are used for each map pertaining to younger women, regardless of race or time period. This common cutpoint approach was selected because we were especially interested in comparing trends in breast cancer mortality rates by region over time. Because changes in breast cancer mortality rates have been relatively small over calendar time, this method also enables effective visualization of the geographic variation present in each calendar period. Maps were prepared with color codes that used five shades of red to indicate higher rates and five shades of blue to indicate lower rates. Areas with rates based on sparse numbers were shaded gray.

For white and black women in four age groups (20–49, 50–64, 65–79, 80+ years), region-specific (defined in the Appendix and shown in Figure 1) rates per 100,000 woman-years for five calendar periods for white women (1950–1959, 1960–1969, 1970–1979, 1980–1989, 1990–1999) and 3 calendar periods for black women (1970–1979, 1980–1989, 1990–1999) were directly age-adjusted using the 2000 US population distribution as standard. We also calculated relative risk estimates (RR) with the South as the reference category at each calendar period, and percent change across four time periods (*i.e.*, 1950–1959 to 1960–1969, 1960–1969 to 1970–1979, 1970–1979 to 1980–1989, 1980–1989 to 1990–1999). Percent change (*e.g.*, percent change from 1950–1959 to 1960–1969) was calculated by subtracting the rate in the later calendar period (*e.g.*, 1960–1969) from the rate in

the earlier calendar period (*e.g.*, 1950–1959) and dividing this difference by the rate in the earlier calendar period (*e.g.*, 1950–1959).

This study represents a descriptive exploratory analysis of secular trends in breast cancer mortality by region with no *a priori* hypotheses. Therefore, no statistical tests were performed.

Results

Ages 20–49 years

Among white women ages 20–49 years, the maps show that the modest Northeast/South gradient present during the period 1950–1969 disappeared by 1990–1999, largely due to more substantial declines in rates in the Northeast than in the South (Figure 2). As shown in Table 1, breast cancer mortality rates in this age group remained stable from 1950 to 1969 in all regions. In the 1970s rates declined in the Northeast, Midwest, and West whereas the rate in the South remained essentially stable. From 1980 to 1999, rates declined in all four regions; however, the declines over this time period were greatest in the Northeast, intermediate in the Midwest and West, and smallest in the South. As the result of these patterns, rates in all four geographic regions converged by 1990–1999.

Compared to white women 20–49 years, rates among similarly-aged black women were relatively high in all regions of the country in each time period (Figure 2). As shown in Table 1, breast cancer mortality rates among black women 20–49 years were just slightly higher in the Northeast than the South in 1970–1979 whereas the reverse was true by 1990–1999. Rates declined slightly in the 1980s in the Northeast whereas rates increased in the Midwest, West and South. In the 1990s rates declined slightly in the Midwest, West and Northeast but remained essentially stable in the South.

Breast cancer mortality rates during 1970–1989 were higher among blacks than whites in virtually all areas, and these disparities became even more pronounced during 1990–1999 due to more substantial declines in rates among whites.

Ages 50 years and older

Among white women 50 years and older, the overall geographic pattern was generally similar over the three time periods, with rates high in the Northeast, intermediate in the Midwest and West and low in the South (Figure 3). However, the geographic variation, particularly the Northeast/South gradient, became less

pronounced over time, due especially to increasing rates in the South (Figure 3).

Because temporal trends in breast cancer mortality rates vary by age for the nation as a whole, we further examined time trends by region separately for women aged 50–64 years, 65–79 years, and 80 years and older (Table 1). The historical pattern of rates high in the Northeast, intermediate in the Midwest and West, and low across the South, was especially attenuated over time among white women aged 50–64 years. The RR for the Northeast compared to the South in 1950–1959 declined from 1.48 to 1.15 in 1990–1999. Among white women 50–64 years, rates increased in all four regions from the 1950s to the 1960s but more substantially in the South, continued to increase slightly in the 1970s in all four regions, declined slightly in the Northeast, Midwest, and West but not in the South in the 1980s, and declined more substantially in the Northeast, Midwest and West than in the South in the 1990s.

Among white women 65–79 years, the historical pattern was also attenuated over time. The RR for the Northeast compared to the South declined from 1.54 in 1950–1959 to 1.25 in 1990–1999. Rates declined slightly in the 1960s in the Northeast, Midwest, West but remained essentially stable in the South. In the 1970s and 1980s, rates increased in the all four regions but to a larger extent in the South. In the 1990s, there were slight declines in all regions except in the South, where the rate remained essentially unchanged.

Among white women 80 years and older, the historical pattern was also attenuated. The RR for the Northeast compared to the South in 1950–1959 decreased from 1.60 to 1.30 in 1990–1999. Rates declined in the 1960s and 1970s in all four regions but to a lesser extent in the South. Rates increased in all four regions in the 1980s and 1990s, with the largest increase observed in the South.

Among black women 50 years and older, mortality rates were higher in the Northeast, West and Midwest than in the South in 1970–1989. Although there was less geographic variation present in the 1990s, pockets of lower mortality rates still remained across areas of Alabama, Georgia, and Florida (Figure 2). From the maps, it is clear that rising breast cancer mortality rates in the South played a major role in the attenuation in geographic variation among older blacks. In each age category (50–64 years, 65–79 years and 80 years and older), the geographic variation present in 1970–1979 was completely attenuated by 1990–1999 (Table 1). Among black women 50–64 years, rates increased in all four regions in the 1980s (more so in the West, but this estimate was based on small numbers of blacks). In the 1990s, there were declines in the Northeast, Midwest

and West but rates still continued to increase in the South. Among black women 65 years and older, rates increased during the 1980s and 1990s in all regions, and the increases were largest in the South.

In 1970–1979, breast cancer mortality rates among women 50 years and older were comparable or somewhat lower in blacks than whites in each region of the country. By the 1990s, breast cancer mortality rates were substantially higher among blacks than whites in all regions among women ages 50–64 years, with the relative risks comparing blacks to whites ranging from 1.21 in the Northeast to 1.40 in the South. Among women ages 65–79 years, relative risks comparing blacks to whites ranged from 0.96 in the Northeast to 1.17 in the South. Among women 80 years and older, relative risks comparing blacks to whites ranged from 0.93 in the Northeast to 1.13 in the South (data not shown).

Discussion

In the current study, we examined cancer mortality rates from 1950 to 1999 by region of the country. Calendar-year trends in breast cancer mortality varied substantially by age group and race. However, for all age and race groups there was a pattern of less favorable changes in the South than in other regions of the country, particularly the Northeast. That is, when there were declines across all regions the declines were smaller in the South (*e.g.*, whites 50–64 years old in the 1990s), and when there were increases across all regions, the increases were greatest in the South (*i.e.*, whites 80 years and older in the 1990s). In some instances, rates increased in the South whereas rates in other regions were stable or declined (*e.g.*, blacks 50–64 years in the 1990s). Overall, breast cancer mortality rates have been lower in the South than in the Northeast, but the difference has narrowed over time in all age and race groups, and in certain groups (*i.e.*, blacks of all ages, white women 20–49 years), the regional variation was gone by the 1990s.

Possible reasons for the differences in trends in breast cancer mortality by region fall into three main categories: (1) regional differences in the accuracy of cause of death information; (2) regional differences in breast cancer incidence and underlying breast cancer risk factors; (3) regional differences in screening and treatment for breast cancer.

The reasons for the historically lower breast cancer mortality rates in the South are not completely understood. Incidence rates for 1999 compiled for states with high-quality registry data show that incidence is also

Table 1. Breast cancer mortality rates per 100,000 person-years (age-adjusted 2000 US Standard) by age group, race, 10-year time periods from 1950 to 1999, and census regions

	1950–1959			1960–1969			1970–1979			1980–1989			1990–1999			Percent Change ^a	Percent Change ^b	Percent Change ^c	Percent Change ^d
	Deaths	Rate	RR	Deaths	Rate	RR	Deaths	Rate	RR	Deaths	Rate	RR	Deaths	Rate	RR				
Whites																			
20–49 years																			
Northeast	14,845	18.6	1.38	15,286	18.6	1.34	12,713	16.7	1.21	10,973	14.6	1.13	10,720	11.5	1.02	–0.5	–9.7	–13.1	–20.8
Midwest	12,989	15.7	1.16	13,796	15.8	1.14	12,471	14.8	1.07	12,132	13.8	1.07	12,281	10.8	0.96	0.9	–6.3	–6.9	–21.3
West	6,371	15.7	1.15	7,596	14.9	1.07	7,892	14.2	1.03	9,029	12.9	1.00	10,650	10.8	0.95	–4.8	–4.6	–9.0	–16.8
South	9,889	13.6	1.0 ^e	11,617	13.9	1.0 ^e	12,727	13.8	1.0 ^e	14,547	12.9	1.0 ^e	16,964	11.3	1.0 ^e	2.5	–0.7	–6.6	–12.3
50–64 years																			
Northeast	24,372	74.1	1.48	29,050	79.5	1.35	32,437	81.1	1.30	30,206	80.1	1.27	21,693	65.2	1.15	7.2	2.1	–1.2	–18.6
Midwest	22,510	66.0	1.31	26,565	70.4	1.20	30,143	72.1	1.16	29,129	71.4	1.13	23,335	58.7	1.03	6.7	2.4	–0.9	–17.8
West	9,803	64.4	1.28	13,706	68.4	1.16	18,743	72.4	1.16	20,397	70.3	1.11	18,263	58.1	1.02	6.2	5.8	–2.9	–17.4
South	13,396	50.3	1.0 ^e	20,385	58.8	1.0 ^e	27,732	62.4	1.0 ^e	32,196	63.1	1.0 ^e	31,252	56.8	1.0 ^e	16.9	6.1	1.2	–10.0
65–79 years																			
Northeast	20,868	122.2	1.54	24,980	117.3	1.48	30,038	123.2	1.41	36,065	131.0	1.30	35,403	125.1	1.25	–4.0	5.0	6.4	–4.5
Midwest	20,557	110.2	1.39	24,606	107.9	1.36	28,546	110.3	1.27	35,454	119.1	1.19	36,007	114.8	1.14	–2.0	2.2	8.0	–3.6
West	8,521	103.6	1.31	11,384	99.0	1.25	15,625	103.4	1.19	22,961	115.3	1.15	25,806	108.9	1.09	–4.5	4.5	11.5	–5.5
South	11,061	79.4	1.0 ^e	15,755	79.2	1.0 ^e	24,549	87.2	1.0 ^e	37,280	100.5	1.0 ^e	42,967	100.3	1.0 ^e	–0.2	10.1	15.3	–0.2
80+ years																			
Northeast	6,848	212.9	1.60	8,708	184.5	1.48	12,362	177.5	1.39	17,858	193.1	1.38	22,980	200.3	1.27	–13.3	–3.8	8.8	3.7
Midwest	6,688	182.2	1.37	8,969	163.6	1.31	12,713	158.2	1.24	17,954	168.0	1.20	24,473	183.7	1.16	–10.2	–3.3	6.2	9.4
West	2,581	165.9	1.25	4,064	149.9	1.20	6,441	146.1	1.14	10,095	158.5	1.14	14,579	165.4	1.05	–9.7	–2.5	8.4	4.4
South	3,321	133.1	1.0 ^e	5,422	125.0	1.0 ^e	9,081	128.1	1.0 ^e	15,432	139.5	1.0 ^e	24,831	157.8	1.0 ^e	–6.1	2.5	8.9	13.1
Blacks																			
20–49 years																			
Northeast	N/A	N/A	N/A	N/A	N/A	N/A	1,616	19.3	1.07	1,917	18.9	0.94	2,278	17.3	0.87	N/A	N/A	–2.0	–8.5
Midwest	N/A	N/A	N/A	N/A	N/A	N/A	1,516	19.1	1.06	1,878	20.5	1.02	2,409	19.2	0.97	N/A	N/A	7.4	–6.2
West	N/A	N/A	N/A	N/A	N/A	N/A	570	18.6	1.03	861	20.5	1.02	1,141	18.2	0.91	N/A	N/A	10.4	–11.4
South	N/A	N/A	N/A	N/A	N/A	N/A	3,401	18.0	1.0 ^e	4,876	20.2	1.0 ^e	7,117	19.9	1.0 ^e	N/A	N/A	12.1	–1.6
50–64 years																			
Northeast	N/A	N/A	N/A	N/A	N/A	N/A	2,317	74.6	1.13	3,042	81.4	1.11	3,385	79.2	1.00	N/A	N/A	9.1	–2.7
Midwest	N/A	N/A	N/A	N/A	N/A	N/A	2,261	74.8	1.13	2,893	83.7	1.15	3,058	80.7	1.02	N/A	N/A	11.9	–3.7
West	N/A	N/A	N/A	N/A	N/A	N/A	791	70.4	1.07	1,180	84.7	1.16	1,290	75.6	0.95	N/A	N/A	20.4	–10.8
South	N/A	N/A	N/A	N/A	N/A	N/A	5,481	66.0	1.0 ^e	6,599	73.0	1.0 ^e	8,049	79.4	1.0 ^e	N/A	N/A	10.7	8.8
65–79 years																			
Northeast	N/A	N/A	N/A	N/A	N/A	N/A	1,452	101.3	1.22	210	104.4	1.07	2,940	120.7	1.02	N/A	N/A	3.0	15.6
Midwest	N/A	N/A	N/A	N/A	N/A	N/A	1,453	96.7	1.17	2,258	114.0	1.17	3,014	129.0	1.09	N/A	N/A	17.9	13.1
West	N/A	N/A	N/A	N/A	N/A	N/A	528	104.9	1.26	862	111.2	1.14	1,142	113.9	0.97	N/A	N/A	6.0	2.4
South	N/A	N/A	N/A	N/A	N/A	N/A	4,166	83.0	1.0 ^e	5,978	97.7	1.0 ^e	7,807	117.9	1.0 ^e	N/A	N/A	17.7	20.7
80+ years																			
Northeast	N/A	N/A	N/A	N/A	N/A	N/A	424	150.5	1.42	794	167.7	1.21	1,303	185.3	1.04	N/A	N/A	11.4	10.5
Midwest	N/A	N/A	N/A	N/A	N/A	N/A	489	152.9	1.44	878	170.5	1.23	1,413	198.1	1.11	N/A	N/A	11.5	16.2
West	N/A	N/A	N/A	N/A	N/A	N/A	143	138.4	1.31	302	160.7	1.16	475	162.8	0.91	N/A	N/A	16.1	1.3
South	N/A	N/A	N/A	N/A	N/A	N/A	1,224	105.8	1.0 ^e	2,317	138.2	1.0 ^e	4,080	178.2	1.0 ^e	N/A	N/A	30.6	28.9

^a 1950–1959 to 1960–1969.^b 1960–1969 to 1970–1979.^c 1970–1979 to 1980–1989.^d 1980–1989 to 1990–1999.^e Referent region.

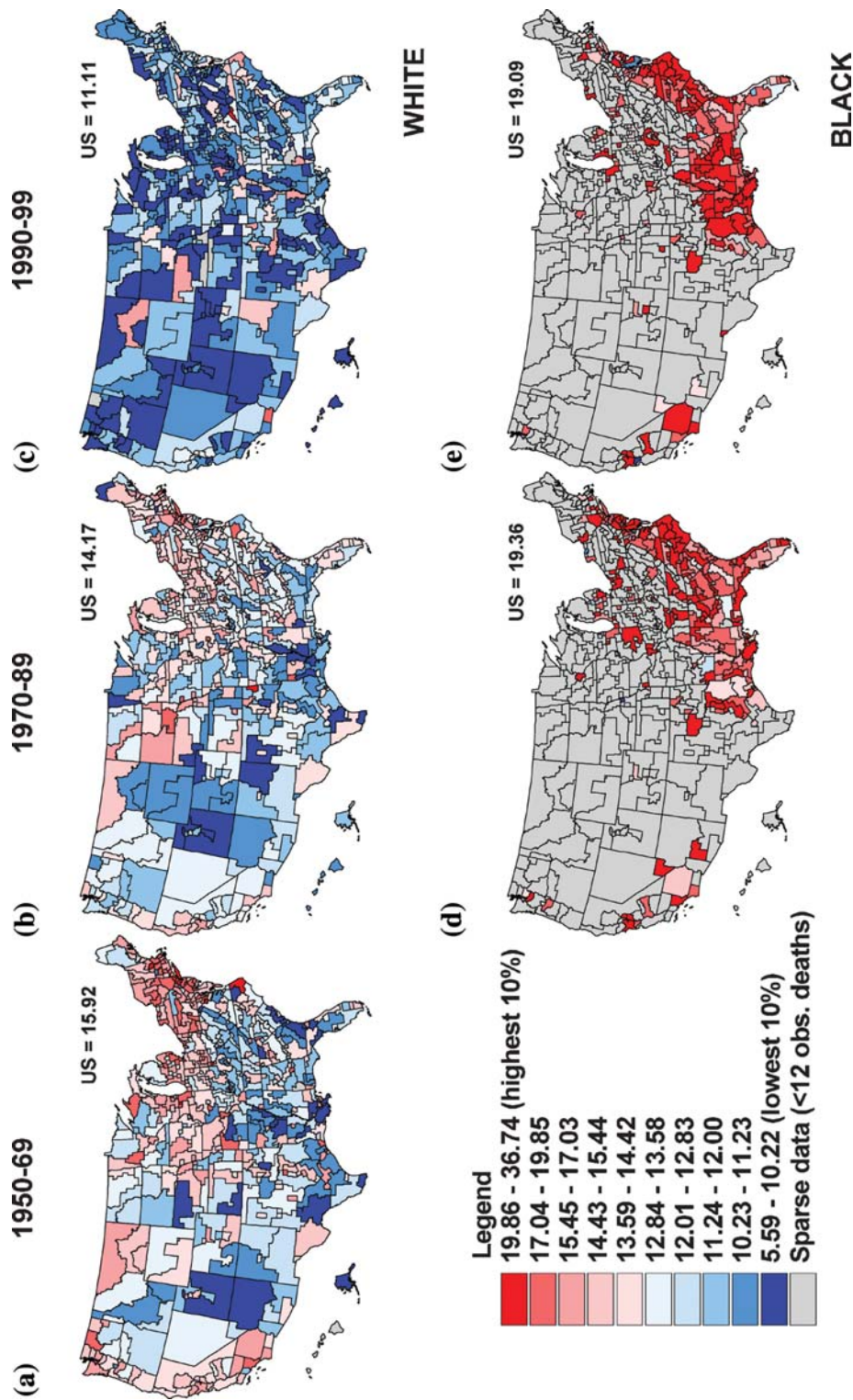


Fig. 2. Breast cancer mortality rates per 100,000 person-years by state economic area (age-adjusted 2000 US population) among women ages 20–49 years: (a) whites, 1950–1969; (b) whites, 1970–1989; (c) whites, 1990–1999; (d) blacks, 1970–1989; (e) blacks, 1990–1999.

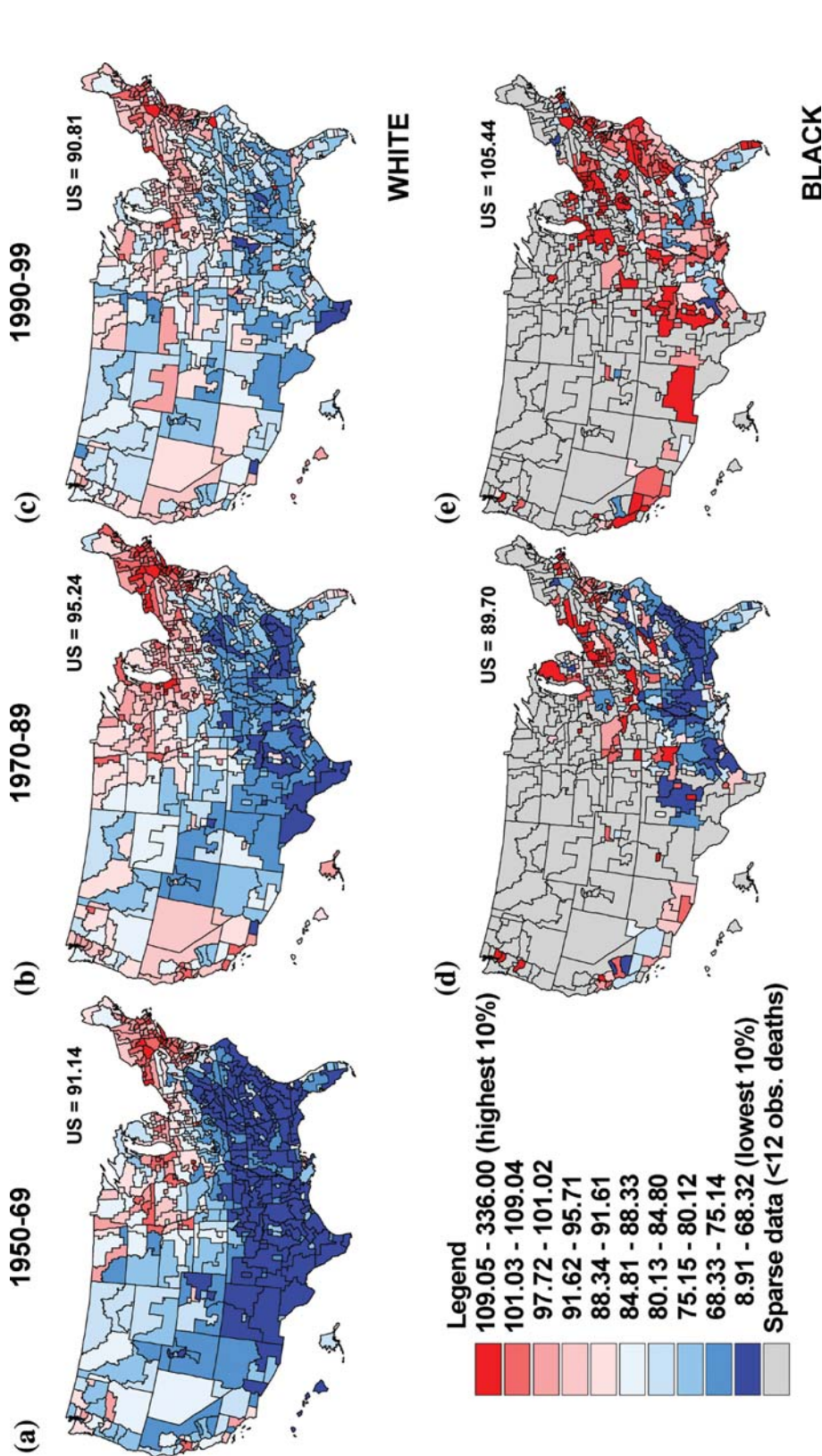


Fig. 3. Breast cancer mortality rates per 100,000 person-years by state economic area (age-adjusted 2000 US population) among women ages 50 years and older: (a) whites, 1950–1969, (b) whites, 1970–1989; (c) whites 1990–1999; (d) blacks, 1970–1989; (e) blacks, 1990–1999.

lower in the South than in the Northeast [10], suggesting that the comparatively higher mortality in the Northeast likely reflects, at least in part, a higher prevalence of established breast cancer risk factors. Indeed, our analysis based on 1987 breast cancer mortality rates for the Northeast, Midwest, West and South suggested that delayed childbearing could explain some, but not all, of the higher breast cancer mortality rates in the Northeast [3]. However, whether breast cancer incidence is truly higher in the Northeast than in the South is still debated; the Nurse's Health study, albeit with a highly selected population, did not find a Northeast/South gradient in breast cancer incidence [11]. Thus, it is important to keep in mind that variation in mortality can also reflect issues related to screening, treatment and accuracy of death certificate completion and coding.

Changing childbearing practices have been shown to closely parallel secular trends in US breast cancer mortality rates prior to 1989. Based on a birth cohort analysis of white women, Tarone and colleagues reported that the declining breast cancer mortality rates from 1973 to 1988 among women 30–59 years (corresponding to mothers of the baby boom generation), and the increasing rates in women 60–89 years over this same time period were consistent with longitudinal childbearing practices [7, 12]. It is therefore of interest to speculate whether regional differences in trends in childbearing practices might account for certain regional time trends in breast cancer mortality. An analysis of fertility patterns conducted by O'Connell found that the smallest increase in fertility during the 1940–1960 period (corresponding to mothers of the baby boom generation born between 1924 and 1938) occurred in states that already had the highest fertility rates, notably the South [13]. Thus, the absence of a decline in rates among white women 50–64 years in the 1980s in the South may reflect regional trends in fertility patterns.

As noted by Tarone and colleagues [7, 12], the continued decline in breast cancer mortality rates through the 1990s among women younger than 50 years of age in the nation as a whole is unexpected based on delays in childbearing practices among this cohort. Based on an analysis of fertility patterns by O'Connell, the greatest decline in fertility during the 1960–1977 period occurred in the states that had the lowest fertility rates, principally, the Northeast [13]. Thus, despite apparently more substantial recent declines in fertility in the Northeast, breast cancer mortality rates among young women have declined more in the Northeast than in other regions of the country. Available data on trends in established or hypothesized breast cancer risk factors or protective factors, including energy or fat intake, lower fruit and vegetable intake, alcohol intake, and oral

contraceptive use are not consistent with the decrease in breast cancer mortality among baby boomers [7].

For the nation as a whole, recently declining breast cancer mortality rates among women younger than 50 years of age may possibly be attributed, at least in part, to birth cohort trends in obesity, physical activity or another as yet unidentified protective factor [12]. Obesity is associated with a decreased risk of premenopausal breast cancer [14], and the prevalence of obesity has risen steadily over the past 20 years in the US in both black and white women [15]. It is therefore interesting to speculate whether regional time trends in obesity might account for recent breast cancer mortality trends by region. Based on data from the Behavioral Risk Factor Surveillance System (BRFSS), the percentage increase in obesity among adults from 1991 to 1998 tended to be slightly steeper in states in the South compared to those in the Northeast [15]. Thus, this pattern is not consistent with comparatively smaller recent declines in breast cancer mortality in younger women in the South. It is also worth noting that the more substantial declines in breast cancer mortality in younger white women compared to younger black women are not consistent with the apparently similar increases in obesity that have occurred over time among adult women in both racial groups. Of interest, despite the increasing obesity trends, breast cancer mortality rates have tended to decline among older women, for whom obesity increases risk and reduces survival [16].

For 50 years, both the South and West have experienced substantial in-migration from the Northeast and Midwest [17]. As women in the Northeast have been shown to have a higher prevalence of certain breast cancer risk factors, such as later age at first birth [3], this domestic migration pattern may account for some of the attenuation in regional variation in breast cancer mortality rates over time.

In the nation as a whole, increased utilization of mammography screening and advances in treatment (e.g., tamoxifen, adjuvant polychemotherapy) are generally believed to have contributed, at least in part, to declines in breast cancer mortality across varied age groups in the 1990s [7]. Several studies have noted geographic variations in mammography screening and in the quality of treatment received for breast cancer [18, 19]. Thus, the existing recent trends by region could signal slower adoption of efficacious screening practices and treatment advances in the South or deficiencies in patient access and utilization of medical care. For example, the percentage of women 40 years and older who reported in 1989 having a prior mammogram during the past 2 years was somewhat higher in states in the Northeast than those in the South [20]. With

respect to adoption of treatment advances, use of breast-conserving treatment for early-stage breast cancer in 1993, typically considered as one aspect of state-of-art treatment, was reported as highest among Medicare recipients in the Northeast, and lowest in the South and Midwest, except Florida [21]. Also of interest, we found that the black–white disparity in recent breast cancer mortality rates was greatest in the South. Lannin *et al.* (22) have described the potential importance of religious and cultural beliefs in the diagnosis of advanced stage disease among black women in the South.

Mortality data are based on death certificates and are dependent on the quality of the information recorded. However, the quality of demographic data (sex, race, age, address) on the certificates has been found to be good [23–25] and diagnoses of cancer are considered generally reliable. A comparison of the information on the death certificates with autopsy findings revealed that cancers are more accurately diagnosed than other causes of death [26]. For breast cancer, there is good agreement between the underlying cause of death recorded in the death certificate and the primary cancer site diagnosed in the hospital [27]. Geographic variation in the accuracy of death certificates has not been well studied and may contribute to some of the patterns observed [2]. Coding of the cause of death, however, is conducted nationally according to strict guidelines, using an automated system, and thus should not vary regionally [28].

There is a need for continued monitoring of regional trends in breast cancer risk and prognostic factors, incidence rates, mortality rates, and medical care related to breast cancer, including quality of screening and treatment. Such data could be used to further explore why the historical advantage of the South has been eroded.

Appendix – Census regions

Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New-York, Pennsylvania, Rhode Island, and Vermont.

Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland,

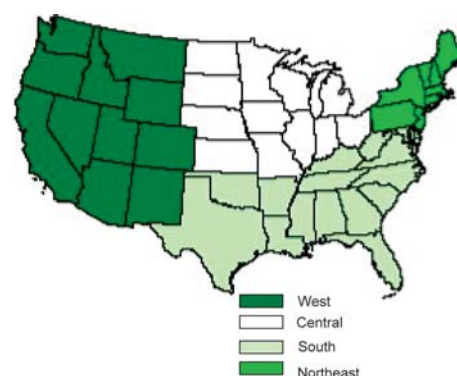


Fig. 1. Four US census regions.

Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia.

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